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## **Oil and Natural Gas and Rural Local Government Finances in the Gulf of Mexico Region\***

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**ABSTRACT** National energy policy is focused on increasing production and exploration of existing energy sources (particularly oil and natural gas). What impact this might have on local institutions, particularly local governments who are often responsible for providing the infrastructure necessary to sustain production and exploration, is a relatively unexplored but important question. Sociological theory predicts that the effect will be most felt in nonmetropolitan communities that specialize in oil and gas production. We pursue this issue by examining the impact of the oil and gas industry boom and bust period of the 1970s and 1980s on local government finances in oil and gas intensive nonmetropolitan counties/parishes in the five states in the Gulf of Mexico region. We find that the 1977-82 boom in the oil and gas industry created more non-governmental revenue growth for local governments, and that the 1982-87 bust led to less non-governmental revenue growth for that period. We also find that in oil and gas counties/parishes revenue growth did not keep pace with expenditure growth during that period. We found similar results for expenditure growth for the boom and bust period. Mixed evidence was discovered to support the proposition that the bust cycle had

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long-term effects on local government revenue and expenditure growth in oil and gas counties/parishes.

In an address to the National Petroleum Council on June 23, 2003, U.S. Secretary of Energy Spence Abraham warns about severe short-run shortages of energy sources, particularly natural gas.<sup>1</sup> The summer of 2004 has brought \$42.00 per barrel crude oil prices, and regular unleaded gasoline prices averaging over \$2.00 per gallon.<sup>2</sup> In that speech, the Secretary of Energy reiterated the administration's national energy policy that is focused on increased production from existing energy sources, and exploration of new sources of oil and natural gas. The impact of renewed production and exploration are, potentially, far-reaching. The energy cycles in the 1970s and 1980s taught the nation several lessons about the geo-political nature of oil and gas markets, and the importance of industry diversification at a local level (see Gramling 1996; Minerals Management Services 1998; Seydlitz and Laska 1994). In this analysis we examine how the changes in the oil and gas industry affected local government finances in nonmetropolitan communities in the Gulf of Mexico region. By examining how past energy cycles affected local government finances, we can start to gain an understanding how increased production and exploration might affect local government finances in the future.

The oil and gas industry experienced a boom and bust cycle over the last 20 years, with a boom between 1977 and 1982, and a major bust in the oil and gas industry occurring between 1982 and 1987 (Minerals Management Services 1998; Seydlitz and Laska 1994). Boom and bust cycles create problems for rural localities (see Jobes 1999; England and Albrecht 1984; Krannich and Grieder 1984). The short-term assumptions about boom and bust cycles for rural local government finances are predictable. That is, booms bring increased demand for services, and busts create revenue shortfalls (see Dougherty, Klase and Song 1999; Reeder and Jansen 1995). However the reality is often more complicated. Johnson et al. (1995) show that both growth and decline can create the same types of financial pressures on local governments. Furthermore,

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<sup>1</sup> [http://energy.gov/HQPress/releases03/junpr/pr03136\\_v.htm](http://energy.gov/HQPress/releases03/junpr/pr03136_v.htm)

<sup>2</sup> <http://www.eia.doe.gov/emeu/steo/pub/contents.html>

while some research exists on the impact of economic change on local government finances (Dougherty et al. 1999; MacManus 1993), less has been done on the long-term implications of boom and bust cycles in extractive industries on local government finances in rural America.

In this analysis we utilize a human ecology perspective to frame the research question. We explore the impact of boom and bust cycles on local government finances in rural counties in the Gulf of Mexico states in order to determine how these cycles affected local government finances in the short and long run. How long it took the oil and gas counties and parishes to recover is potentially important in light of new energy policies that emphasize production.

### **Oil and Natural Gas Industry Cycles**

The 1970s were a period of expansion in the exploration and production of oil and natural gas (Seydlitz and Laska 1994). Increasing demands on onshore domestic supplies of oil, and political instability surrounding OPEC and the Middle East increased offshore oil and natural gas exploration activities in the Gulf of Mexico (Gramling and Freudenburg 1990). The 'boom' is reflected in employment data. In 1970, 75,418 workers were directly employed full-time in the oil and natural gas industry in the coastal economies of the Gulf of Mexico. In 1980, that number had grown to 145,802, a net increase of 93 percent (U.S. Bureau of the Census 1981, 1991). Moreover, these numbers do not reflect changes in oil and gas multiplier industries such as manufacturing of equipment, water transportation, wholesale trade, and general services.

During the 1980s, however, the oil and natural gas industries experienced a sharp decline in employment, brought about by a number of geopolitical issues (Heilbroner and Milberg 1999). Between 1980 and 1990, the total number of workers in the oil and natural gas industries declined from 145,802 to 112,370 in the coastal economies of the Gulf of Mexico, a decrease of 23 percent. The impact was much more severe in certain areas in the Gulf of Mexico coastal economies. For example, the Lafayette, Louisiana, economy lost 14,000 jobs in the oil and natural gas extraction industries between 1982 and 1988, a 63 percent loss in this one industry. The 1988 unemployment rate was over 16 percent throughout the

greater Lafayette economy.<sup>3</sup> Total employment in the Lafayette economy dropped from 200,000 workers in 1982, to 160,000 workers in 1987 (Bureau of Economic Analysis 2003).

### **Human Ecology Theory**

We frame the research question of what is the impact of the boom and bust cycle on local government finances in nonmetropolitan counties/parishes in the context of human ecology theory. Human ecology theory explains how local ecosystems interact with their environments for sustenance. Much empirical research in this field focuses on the structure and diversity of sustenance activities and the implications for local ecosystem size, function and organization (Hawley 1986; Poston 1984; Frisbie and Poston 1976; 1978; Nord and Luloff 1993; Mencken 1997; Murdock, Hoque and Backman 1993). The range and diversity of sustenance functions are important determinants of system size, complexity and organization. Generalist ecosystems (those with a variety of sustenance activities) and specialist ecosystems (those with one or two activities) both present advantages and disadvantages for growth and social organization (Poston 1984). Generalist systems are larger in size and more complex in structure. Fluctuations in a given niche do not reverberate throughout the entire system so long as the other niches upon which the ecosystem depends for sustenance are independent, and remain relatively stable. As a result, generalist systems tend to be more stable over time. This stability over time is important for local government finances because it allows administrators to plan for incremental changes in the supply of revenues and the demand for resources.

Nonmetropolitan economies that are natural resource dependent face significant challenges during boom and bust periods (Nord and Luloff 1993). These specialist economies are often dependent upon one or two niches for sustenance, in this case the oil and gas industry (Gramling and Freudenburg 1990; Poston 1984). Niche contraction and expansion will alter drastically the social

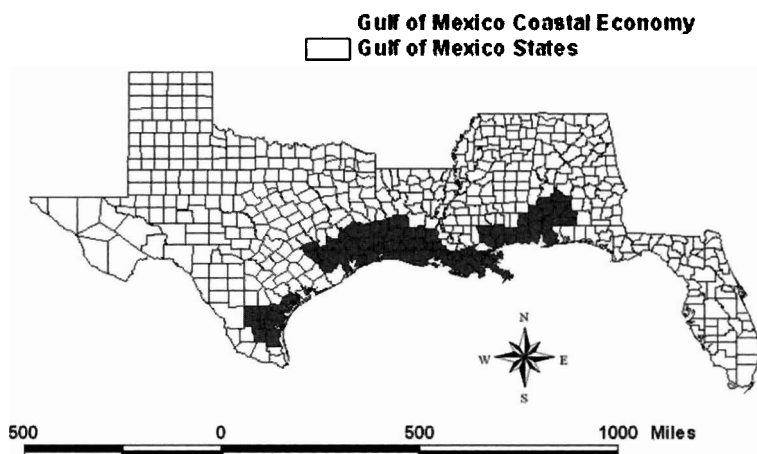
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<sup>3</sup>The greater Lafayette economy includes Lafayette Parish and surrounding parishes in the Lafayette LMA: Acadia, Evangeline, Iberia, St. Landry, St. Martin, Vermilion.

organization of the ecosystem, as too much rapid growth can create a 'boomtown' effect, and rapid contraction can create short-term and long-term negative consequences (see Jobes 1999; England and Brown 2003; Latimer and Mencken 2003; Henderson 1991). Hawley (1986) argues that effective local governments are necessary to raise the needed revenues to provide the requisite services to support sustenance production (i.e. schools, roads, fire protection). Growth will generate more revenue, thus allowing local governments to provide more services. However, during growth periods, community resources can be stressed by the increased demand for local resources. If revenues do not keep up with the increased demand on services, governments may be forced to cut services, or go into deficit financing in order to meet service demand (Warner 2003; Reeder and Jansen 1995). Conversely, a contraction in the niche can create a severe shortfall in the supply of resources (i.e. local revenues).

Long-term changes in the coal industry in Appalachia have shown that natural resource based nonmetropolitan economies have a more difficult time adjusting to niche contractions and closures (Maggard 1994; Mencken 1997; Latimer and Mencken 2003; Billings and Tickamyer 1993). These industries tend to employ low-skilled workers, to be geographically isolated, and have infrastructures not conducive to economic growth in emerging industries, like high technology (Glasmeier and Howland 1994; 1995; RSS 1993). Consistent with ecological theory is the assumption that the boom and bust cycle in the oil and gas industry will have greater positive, and negative, effects on local government finances in the specialist ecosystems highly invested in the oil and gas niche for sustenance than in similar ecosystems without a direct oil and gas connection. The boom of the late 1970s and early 1980s should have brought more revenue to local governments in oil and gas counties/parishes. The bust of the 1980s in the oil and gas industry should have generated less revenue growth in the oil and gas counties/parishes, compared to similar economies without a direct connection to the oil and gas industry. How long the effects will last, though, are currently undocumented. We expect this analysis to provide some insight.

**Map 1. Gulf of Mexico Region and Oil/Gas Coastal Economy Counties/Parishes.** Source: Killian and Tolbert 1993.



### Analysis

There are 67 counties and parishes that constitute the Gulf of Mexico coastal economies (GMCE). Many of these counties and parishes were directly involved in offshore oil and natural gas exploration and production, or in related multiplier industries, such as manufacturing or water transportation. Other counties and parishes were functionally integrated into the local economies that were involved in oil and natural gas or related industries (see Map 1).<sup>4</sup>

The analysis explores nonmetropolitan local government finances in oil and gas industry counties/parishes using a technique from a family of quasi-experimental techniques from geography and regional science (Isserman and Rephann 1995). First, the nine

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<sup>4</sup> We define functional integration as economically integrated into a Gulf Coast economy if the county or parish belongs in one of the nine Labor Market Areas (LMAs) along the Gulf Coast. Labor Market Areas are clusters of counties based on commute-to-work patterns from the 1990 census (see Killian and Tolbert 1993).

nonmetropolitan counties/parishes in the GMCE region with the highest concentration of mining earnings in 1982 (over 10 percent of total earnings) are identified. Assuming that these are the most oil and natural gas intensive counties/parishes in the region, the quasi-experimental techniques are utilized to match each of these counties/parishes with 'twin' counties/parishes in the Gulf of Mexico states. The analysis employs a version of a Mahalanobis distance matrix to match nonmetropolitan counties/parishes on key variables at a point in time (1970) prior to the oil and natural gas cycles of the 1970s. These two groups are then compared on local government finance issues from 1977 (beginning of the boom) through 1997 (ten years after the bust).

The analysis has both a primary and a secondary component. The application of this quasi-experimental technique in regional science requires that geographical units be matched on socio-demographic variables at a time point prior to the 'stimulus' event. In the primary analysis, the counties/parishes are matched on the following socio-demographic variables: Per capita income 1970; population 1970; percent urban 1970, percent white 1970, number of public administration employees 1970, farm population 1970, manufacturing establishments 1972. These matching variables are not chosen at random. They are key variables from human ecology research which measure size (population, percent urban), sustenance structure (public employees, farm population, manufacturing), and important social demography measures (income, percent white). These and similar variables are used as matching variables when geopolitical units of analysis (such as counties/parishes) are examined (see Isserman and Rephann 1995 for application).

While these variables are measures of important industry and demographic constructs, in order to validate further the analysis, a secondary analysis is performed in which counties/parishes are matched on an alternative set of socio-demographic measures. These include core demographic measures: Per capita income 1970; population 1970; percent urban 1970, percent white 1970; and different industry measures: number of craft/production workers 1970; total labor force 1970; number of FIRE (finance, insurance, and real estate) workers 1970; number of professional service workers 1970; and number of farmers 1970.

The following is a list of the nine most mining intensive counties/parishes: Kleberg TX, Refugio, TX, Cameron, LA, St.



Mary's LA, Plaquemines, LA, Chambers, TX, Vermilion, LA, Duval TX, Iberia Parish, LA. We computed matching counties/parishes for each of these by 'filtering' all other nonmetropolitan counties/parishes in the five state region (but not in the 67 counties/parishes in the Gulf of Mexico coastal economies) through the matching variables. We began the process of selecting matching counties by setting the distance limits to one-half of a standard deviation for nonmetropolitan counties/parishes on all of the matching variables.<sup>5</sup> This conservative distance provided matches for each county/parish except St. Mary's LA, Duval TX and Kleberg TX. By extending the distance to 1 standard deviation we were able to compute matches for St. Mary's LA and Duval TX.<sup>6</sup> We were unable to match Kleberg TX and removed it from this analysis. The process extracted 15 potential matching counties/parishes with this technique for the primary analysis (see Table 1). The oil and gas counties/parishes are compared to the matched counties on a number of local government fiscal measures in order to explore how the boom and bust pattern in the oil and gas industry during the 1970s and 1980s affected local government finances in nonmetropolitan counties using difference of means tests with students' *t* distribution (required because of small sample sizes). In the secondary analysis, the eight oil and gas counties/parishes were matched to 13 other nonmetropolitan counties/parishes with a different set of matching variables (see Table 1). However, the matching exercise for the secondary group does not present the same level of statistical control because the matching distances had to be extended beyond one standard deviation for many variables to achieve matches (the primary exception was per capita income).

## Results

Table 1 presents the counties/parishes in the primary case control analysis, their matching counties/parishes, and the variables used to

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<sup>5</sup> A 'match' county/parish had to be within  $\frac{1}{2}$  a standard deviation from the oil/gas county/parish value for each of these variables. In order to produce matches for Duval TX and St. Mary's LA we extended the distance to 1 standard deviation.

<sup>6</sup> We would have preferred not to change the distance to make matches for all counties/parishes. However, without this adjustment the oil and gas group would have lost 25 percent of its cases.

**Table 1. Case-Control Matching Variables, Oil/Gas Counties/Parishes and Matching Counties.**

MATCHING VARIABLES	
Primary	Secondary
Per Capita Income 1970	Per Capita Income 1970
Population 1970	Population 1970
Percent Urban 1970	Percent Urban 1970
Percent White 1970	Percent White 1970
Number of Public Administration Employees 1970	Number of Farmers 1970
Farm Population 1970	Number of Prof/Service Workers 1970
Manufacturing Establishment 1970	Number of Craft/Production Workers 1970
	Number of FIRE Workers 1970
	Total Labor Force 1970
<b>Oil/Gas Counties/Parishes:</b> Cameron, LA; Iberia, LA; Plaquemines, LA; St. Mary, LA; Vermilion, LA; Chambers, TX; Duval, TX; Refugio, TX	
<b>Matching Counties/Parishes Primary:</b> Hardee, FL; Avoyelles, LA; Catahoula, LA; Jones, MS; Lowndes, MS; Monroe, MS; Cass, TX; Franklin, TX; Hall, TX; Hamilton, TX; Hardeman, TX; Jackson, TX; Upton, TX; Zavala, TX	
<b>Matching Counties/Parishes Secondary:</b> Cass, TX; Jones, MS; Franklin, TX; Limestone, AL; Alcorn, MS; Morris, TX; Franklin, FL; Hall, TX; Hardeman, TX; Jack, TX; Presidio, TX; Upton, TX; Wheeler, TX	

match. Table 1 also presents the counties/parishes in the secondary analysis with the alternative set of matching variables. Table 2 presents the primary and secondary case control results in which oil/gas counties/parishes and matching counties are compared on per capita non-governmental revenue, per capita expenditures, growth in revenues and growth in expenditures. In the primary analysis, the data on per capita expenditures show a significantly higher level for oil and gas counties in 1982 (\$742 on average), 1987 (\$632 on average), and in 1992 (\$550 on average), and a marginally significant difference in 1977 (\$382). By 1997, there was no significant difference between oil and gas counties and their counterparts on expenditures. The data for per capita revenues show that the oil and gas

nonmetropolitan counties/parishes had significantly higher levels of per capita non-governmental revenues in 1982 (\$788 higher on average), and also again in 1987 (\$577). There are no statistically significant differences for any other year. Higher expenditures in the oil and gas counties, even during the bust, can be explained by the demands for services and infrastructure that extractive industries can put on local governments (Dougherty et al. 1999).

The secondary analysis shows that oil and gas county/parish expenditure and revenues were statistically higher in 1982, the peak of the oil and gas boom. For oil and gas counties, per capita non-government revenue was higher, in real dollars, in 1982 than in 1992. The same trend is not true for either matching group. For expenditures, the trends between the primary matching analysis and the secondary matching analysis are consistent. For revenues, they are consistent up until 1997. However, the matching procedure indicates more similarity between the oil and gas counties/parishes and the primary matching group than it does for the secondary matching group. Therefore, caution should be used when interpreting the secondary matching group.

The primary matching analysis for expenditure growth show that the nominal growth rate in per capita expenditures for oil and gas counties/parishes was significantly higher (20 percent) between 1977 and 1982 than the primary matching group. However, this growth rate was significantly lower (16 percent) than the primary matching group between 1982 and 1987. These findings indicate that while levels of revenues and expenditures were higher in oil and gas counties, revenues grew at a slower rate in oil and gas counties/parishes. Moreover, the rate of growth of non-government revenues in oil and gas counties/parishes during the 1982-87 bust was also much lower (9.8 percent) than the growth in expenditures in oil and gas counties/parishes for the same time period (15.2 percent). This means local governments in oil and gas counties/parishes had to find alternative sources of revenue, in addition to curtailing some forms of spending. For the secondary matching analysis, we see similar trends for the boom (1977-1982) and bust (1982-1987) periods, but without the same level of statistical significance.

We predicted that growth rates in per capita local government expenditures and revenues would fluctuate with the boom and bust cycle in the oil and gas industry. Between 1987 and 1992, the

Table 2. Local Government Spending Measures Differences of Means Tests for Oil/Gas Counties/Parishes and Matching Counties/Parishes.

Variable	Primary		Secondary	
	Oil/Gas County/Parish	Matching County/Parish	Matching County/Parish	Difference
Per Capita Expenditures 1977 (1992\$)	\$1,727.00	\$1,345.00	\$1,415.00	\$312.00
Per Capita Expenditures 1982 (1992\$)	\$2,175.00	\$1,433.00	\$1,504.00	\$671.00 *
Per Capita Expenditures 1987 (1992\$)	\$2,498.00	\$1,866.00	\$1,873.00	\$625.00 *
Per Capita Expenditures 1992 (1992\$)	\$2,480.00	\$1,929.00	\$2,063.00	\$417.00
Per Capita Expenditures 1997 (1992\$)	\$2,661.00	\$2,356.00	\$2,757.00	-\$96.00
Per Capita Non-Gov revenue 1977 (1992\$)	\$1,365.00	\$937.00	\$1,034.00	\$331.00
Per Capita Non-Gov revenue 1982 (1992\$)	\$1,861.00	\$1,073.00	\$1,162.00	\$699.00 *
Per Capita Non-Gov revenue 1987 (1992\$)	\$2,008.00	\$1,431.00	\$1,514.00	\$494.00
Per Capita Non-Gov revenue 1992 (1992\$)	\$1,704.00	\$1,259.00	\$1,490.00	\$214.00
Per Capita Non-Gov revenue 1997 (1992\$)	\$1,953.00	\$1,728.00	\$2,167.00	-\$214.00
Growth in Per Capita Expenditure 1977-82	27.90%	8.30%	6.47%	21.43% *
Growth in Per Capita Expenditure 1982-87	15.20%	31.13%	25.61%	-10.41%
Growth in Per Capita Expenditure 1987-92	4.80%	6.80%	12.61%	-7.81%
Growth in Per Capita Expenditure 1992-97	10.60%	22.59%	28.32%	-17.72%
Growth in Per Capita Non-Gov Revenue 1977-82	39.40%	15.10%	12.90%	26.50% *
Growth in Per Capita Non-Gov Revenue 1982-87	9.80%	35.20%	27.70%	-17.90% *
Growth in Per Capita Non-Gov Revenue 1987-92	-11.80%	-9.30%	3.30%	-15.10%
Growth in Per Capita Non-Gov Revenue 1992-97	10.60%	17.30%	26.90%	-16.30%

\*p<.05

\*p<.10

Negative differences indicate that oil and gas counties/parishes performed worse

differences between the oil and gas counties/parishes and their counter-parts diminished. The lack of strong, positive growth for oil and gas counties/parishes or matching counties/parishes are most likely attributable to both the recession of the late 1980s and early 1990s (Federal Reserve Bank 1992:862), and in the case of expenditures, the elimination of General Revenue Sharing in 1987 (Falk and Lyson 1993). A trend similar to that for coal counties in Appalachia appears in the 1990s, five years after the end of the bust cycle in the oil and gas industry. Between 1992 and 1997, revenues and expenditure growth are greater, although not statistically, in the matching counties/parishes. These communities that were not directly connected to the oil and gas industry were beginning to move ahead of the oil and gas counties in the decade following the oil and gas bust. The concern is rural oil and gas counties/parishes have become stagnating ecosystems now that the primary niche (oil and gas exploration/production) has been in a near state of permanent contraction.

### **Conclusion**

This paper explored the relationship between local government finances and boom and bust cycles in the oil and natural gas industries for a select group of rural counties/parishes in the Gulf of Mexico region. More investigation of this topic was needed in nonmetropolitan America, and a better understanding of the long-term effects of these cycles was warranted, particularly given renewed emphasis on production and exploration in national energy policy. The research question was informed with human ecology theory. We conceptualized local government revenues as inputs generated from sustenance activities and local government expenditures as the necessary investments that systems make in order to function properly in the procurement of sustenance.

The research question was framed in such a way as to expect that nonmetropolitan ecosystems with oil and gas specialization in the Gulf of Mexico region would be more sensitive to the boom and bust periods in the oil and gas industry. The analysis did find some support for this proposition. The data in Table 2 suggest that 1982-87 bust in the oil and gas industry had negative effects on nonmetropolitan counties/parishes in the most oil and gas intensive region along the Gulf of Mexico (the GMCE). This cycle slowed

the rate of local government revenues from non-government sources to the point where it was almost half the rate of expenditure growth for that cycle. While the case control analysis shows that oil and gas intensive nonmetropolitan counties/parishes have statistically similar levels of per capita non-government revenues, and expenditures 10 years after the 1982-87 bust, the lack of revenue growth in the oil and gas counties/parishes indicates that these economies may have found equilibrium in the form of a stagnation pattern similar to that found in the coal fields of Appalachia (see Latimer and Mencken 2003).

Furthermore, these findings only begin to suggest that the impacts of boom and bust periods have longer duration in specialists systems. We focused on one aspect of system organization: Local government revenues and expenditures. A more holistic approach to the question of what are the long term implications of boom and bust cycles should focus on a variety of indicators of both size and complexity of ecosystems. Moreover, more investigation is needed into how these cycles affect different types of local government expenditures. Do these cycles affect spending on hospitals, police and education uniformly? Or are there key differences which may have a longer impact beyond the boom or bust cycle.

As the federal government designs energy policies that are focused on further exploration and extraction of natural resources, the lessons of the past need to be revisited in order to best prepare for the impact of new activities on local governments. More analyses with a wider array of local government fiscal indicators is needed in order to provide planners with a blueprint of the potential consequences of new oil and gas exploration.

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